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The Semantic Web: Trends and Challenges

11th International Conference, ESWC 2014
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Proceedings

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Preface

The 11th edition of ESWC took place in Crete (Greece), during May 25–29, 2014. Its exciting program included three keynotes by: Steffen Staab (Universität Koblenz-Landau), Luciano Floridi (University of Oxford), and Lise Getoor (University of Maryland).

The main scientific program of the conference comprised 50 papers: 41 research and nine in-use, selected out of 204 submissions, which corresponds to an acceptance rate of 23% for research papers, and of 34.6% for in-use papers. The program was completed by a demonstration and poster session, in which researchers had the chance to present their latest results and advances in the form of live demos. In addition, the conference program included 13 workshops, eight tutorials, as well as a PhD Symposium, the AI Mashup Challenge, the LinkedUp Challenge, the Semantic Web Evaluation Track (featuring three challenges), the EU Project Networking session and a panel on "data protection and security on the Web." The PhD Symposium program included 11 contributions, selected out of 15 submissions.

This year's edition can be described with the following keywords: visionary, advancing, pioneering, trendy.

Visionary, as we had three keynote speakers that brought three very different and inspiring views on the future of the Semantic Web. Steffen Staab, advocating the need for new programming paradigms for dealing with the nature of the Semantic Web; Luciano Floridi, who challenged our community with a vision of a Semantic Web as a means for predicting and manipulating autonomous choices; and Lise Getoor, who showed us how optimization methods can support turning large-scale data into knowledge.

Advancing, as we extended an already excellent scientific program with a new track named "Semantic Web Evaluation" (SemWebEval). The aim of this track is to provide a clear reference to the state of the art on specific Semantic Web tasks, and favor the spreading of proper empirical approaches for their future advancement. SemWebEval features three challenges, each of which rigorously defines a number of Semantic Web tasks and accompanies them with their evaluation datasets and criteria. This year we had a total of ten tasks addressing three main topics: Semantic Publishing, Concept-Level Sentiment Analysis, and Linked Open Data-enabled Recommender Systems. The description of tasks, datasets, and evaluation criteria together with their best results will be published as part of a journal special issue that will follow the publication of these conference proceedings.

Pioneering, as we decided to support workshops that address promising although not yet established topics such as "Semantic Web and Sentiment Analysis" and "Human-Semantic Web Interaction"; as well as emerging topics such as "Finance and Economics on the Semantic Web," and "Semantic Publishing."

We also introduced a unique social identifier for each paper: The reader will notice that each paper in these proceedings includes an official hashtag; it can be used when discussing the paper on social networks and is handy if one wants to retrieve all past and current discussions about it.

Trendy, as we did not overlook to properly address the latest Tim Berners-Lee call for an Internet users' bill of rights. In fact, the ESWC 2014 program included a panel dedicated to "data protection and security on the Web."

As General and Program Committee chairs, we would like to thank everybody that was involved in the organization of ESWC 2014.

First of all, our thanks go to track chairs and all reviewers for their great work, which supported us in building an excellent scientific program. Special thanks go to the PhD symposium chairs, Mathieu d'Aquin and Steffen Staab, who realized an innovative format aimed at ensuring proper mentoring to our promising students. We had a great selection of workshops and tutorials thanks to the excellent work of our workshop chair Harald Sack and our tutorial chair Nathalie Aussenac-Gilles. Thanks to our EU Project Networking session chairs and to our great keynote speakers.

This year we broke the record of poster and demo paper submissions, and we had an extremely high-quality selection of papers (43 demos and 20 posters) thanks to the excellent work of our Poster and Demo Chairs Eva Blomqvist and Raphaël Troncy.

We would like to dedicate a special thanks to Milan Stankovic and all the challenges chairs, who accepted and successfully achieved the organization of the new challenging "Semantic Web Evaluation" track. We were also very happy to host the AI Mashup challenge and the LinkedUp challenge, which contributed to bringing new ideas and exciting application demos.

Thanks to STI International for supporting the conference organization, to Ioan Toma (from STI) for taking care of the budget, and thanks also to our local organizer Irini Fundulaki. YouVivo GmbH deserves a special acknowledgment, in particular Martina Hartl, for the great professional support of the conference organization.

We are very grateful to Silvio Peroni, who spread news about ESWC news timely and effectively, to Serge Tymaniuk, who administered the website, and to our sponsor chairs Axel Ngonga and Achim Rattinger for their precious help in collecting sponsorships for the conference.

We want to point out the remarkable job of the Semantic Technologies coordinators, Luca Costabello, Maribel Acosta Deibe, Anna Lisa Gentile, Alessio Ianbichella, and Andrea Giovanni Nuzzolese, who developed our great "ESWC Conference Live" mobile app.

A special thanks also to our proceedings chair Anna Tordai, who did a remarkable job in preparing this volume with the kind support of Springer.

Last but not least, thanks to all our sponsors listed in the next pages, for their trust in ESWC.

April 2014

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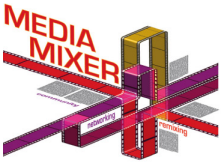
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Programming the Semantic Web

Steffen Staab

Institute for Web Science and Technologies,
University of Koblenz-Landau, Germany

Abstract. The Semantic Web changes the way we deal with data, because assumptions about the nature of the data that we deal with differ substantially from the ones in established database approaches. Semantic Web data is (i) provided by different people in an ad-hoc manner, (ii) distributed, (iii) semi-structured, (iv) (more or less) typed, (v) supposed to be used serendipitously. In fact, these are highly relevant assumptions and challenges, since they are frequently encountered in all kind of data-centric challenges also in cases where Semantic Web standards are not in use. However, they are only partially accounted for in existing programming approaches for Semantic Web data including (i) semantic search, (ii) graph programming, and (iii) traditional database programming approaches. The main hypothesis of this talk is that we have not yet developed the right kind of programming paradigms to deal with the proper nature of Semantic Web data, because none of the mentioned approaches fully considers its characteristics. Thus, we want to outline empirical investigations of Semantic Web data and recent developments towards Semantic Web programming that target the reduction of the impedance mismatches between data engineering and programming approaches.

Keywords: #eswc2014Staab.

Coordination, Semantics, and Autonomy

Luciano Floridi

Oxford Internet Institute, University of Oxford, UK

Abstract. The lecture is divided into four parts. In the first part, I offer a brief and simple introduction to four well-known senses in which different scientific fields speak of complexity, namely state complexity, Kolmogorov complexity, computational complexity, and programming complexity. I then suggest an intuitive way in which they can all be linked in a conceptual, unified view. Against this background, in the second part, I outline a new concept of complexity, which I shall call coordination complexity. This completes the unified view. I then argue, in the third part, that the semantic web helps us dealing with problems with increasingly high degree of coordination complexity, which require the mobilisation of whole systems to be tackled. In the last and concluding part, I highlight one of the consequences of the resolution of problems with high degree of coordination complexity: the predictability and manipulability of autonomous choices.

Keywords: #eswc2014Floridi.

Combining Statistics and Semantics to Turn Data into Knowledge

Lise Getoor

University of Maryland, USA

Abstract. Addressing inherent uncertainty and exploiting structure are fundamental to turning data into knowledge. Statistical relational learning (SRL) builds on principles from probability theory and statistics to address uncertainty while incorporating tools from logic to represent structure. In this talk I will overview our recent work on probabilistic soft logic (PSL), a SRL framework for collective, probabilistic reasoning in relational domains. PSL is able to reason holistically about both entity attributes and relationships among the entities, along with ontological constraints. The underlying mathematical framework supports extremely efficient inference. Our recent results show that by building on state-of-the-art optimization methods in a distributed implementation, we can solve large-scale knowledge graph extraction problems with millions of random variables orders of magnitude faster than existing approaches.

Keywords: #eswc2014Getoor.

Machine Learning with Knowledge Graphs

Volker Tresp

Siemens and Ludwig Maximilian University of Munich, Germany

Abstract. Most successful applications of statistical machine learning focus on response learning or signal-reaction learning where an output is produced as a direct response to an input. An important feature is a quick response time, the basis for, e.g., real-time ad-placement on the Web, real-time address reading in postal automation, or a fast reaction to threats for a biological being. One might argue that knowledge about specific world entities and their relationships is necessary if the complexity of an agent's world increases, for example if an agent needs to function in a complex social community. As one is quite aware in the Semantic Web community, a natural representation of knowledge about entities and their relationships is a directed labeled graph where nodes represent entities and where a labeled link stands for a true fact. A number of successful graph-based knowledge representations, such as DBpedia, YAGO, or the Google Knowledge Graph, have recently been developed and are the basis of applications ranging from the support of search to the realization of question answering systems. Statistical machine learning can play an important role in knowledge graphs as well. By exploiting statistical relational patterns one can predict the likelihood of new facts, find entity clusters and determine if two entities refer to the same real world object. Furthermore, one can analyze new entities and map them to existing entities (recognition) and predict likely relations for the new entity. These learning tasks can elegantly be approached by first transforming the knowledge graph into a 3-way tensor where two of the modes represent the entities in the domain and the third mode represents the relation type. Generalization is achieved by tensor factorization using, e.g., the RESCAL approach. A particular feature of RESCAL is that it exhibits collective learning where information can propagate in the knowledge graph to support a learning task. In the presentation the RESCAL approach will be introduced and applications of RESCAL to different learning and decision tasks will be presented.

The presentation builds to a large degree on the dissertation of Maximilian Nickel, now MIT.

Keywords: #eswc2014Tresp.

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